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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary

Application No.

10/032,394

Applicant(s)

PRAKASH ET AL.

Examiner

Dennis Rosario

Art Unit

2624

Period for Reply -- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 07 December 2007.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 2-4, 6-10 and 15-42 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 2-4, 6-10 and 15-42 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 19 December 2007 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO/SB/08)
Paper No(s)/Mail Date _____
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date _____
- 5) ☐ Notice of Informal Patent Application
- 6) ☐ Other: _____

DETAILED ACTION

Response to Amendment

1. The amendment was received on 12/7/07. Claims 2-4,6-10 and 15-42 are pending.

Specification

2. Due to the amendment the objection to the specification is withdrawn.

Claim Rejections - 35 USC § 112

3. Due to the amendment the rejections of claims 3,4,32 and 41 under 35 USC 112 are withdrawn.

Response to Arguments

4. Applicant's arguments filed 12/7/07 have been fully considered but they are not persuasive.

Applicants state that Lee '060 does "not teach a convolution operator applied to all pixels near a boundary of a domain but not to any interior pixels that are not near the boundary." The examiner does not fully understand applicant's arguments and will assume that Lee '060 does not teach as claimed of claim 2: a convolution operator is applied to process all pixels near a boundary of the domain but is not applied to process any pixels in an interior of the domain that are not near the boundary. The examiner respectfully disagrees since Lee '060 discloses a convolution operator (or filter corresponding to fig. 6C) is applied to process (the result of which is shown in fig. 6C) all pixels (fig. 6A: pixels B,C,D and E) near a boundary (fig. 6A: BLOCK BOUNDARY) of the domain (or any side of the block boundary) but is not applied to process any pixels (fig. 6A: pixels A and F that maintain their values in relation to fig. 6C) in an interior of the domain (or any side of said boundary) that are not near the boundary (since pixels A and F are farther from the boundary as pixels B,C,D and E).

5. Applicant's arguments, see page 16 of the remarks, filed 12/7/07, with respect to the rejection(s) of claim(s) 1,2,16-17,26-30,33-35 under 35 USC 103 have been fully considered and are persuasive. Therefore, the rejection has been withdrawn. However, upon further consideration, a new ground(s) of rejection is made in view of Lee et al. (US Patent 6,539,060 B1).

Claim Rejections - 35 USC § 102

6. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

7. Claims 2-4,6-9,15-17,25-31,33,34 and 36 are rejected under 35 U.S.C. 102(e) as being anticipated by Lee et al. (US Patent 6,539,060 B1).

Regarding claim 2, Lee teaches a method of processing all or a portion of a multi-dimensional signal with a domain composed of a collection of arbitrarily shaped domains via a multi-scale transform comprising the steps of:

- a. Obtaining a multi-dimensional digital image frame (as shown in fig. 5);
- b. Breaking the image frame into constituent arbitrary shaped domains (one of which is shown in fig. 6A that represents an edge portion of an arbitrarily shaped object), or given such a set, that cover all or a portion of the original multidimensional signal domain (since fig. 5 serves as the foundation for all the shapes of fig. 6A); and
- c. Performing a domain adaptive transform (fig. 1:IDCT is used in a transform domain in combination with adaptive characteristics of fig. 1, num. 10) on one or more of the collection (fig. 2: 8 X 8 DCT COEFFICIENTS) of arbitrary shaped domains (since said coefficients have the "same value[s]" in col. 8, lines 3-18 as the pixels of fig. 5), wherein the domain adaptive transform (said IDCT) comprises a transform (since said IDCT is a transform) in which a filter (fig. 1, num. 110 following the transform) comprising a convolution operator (since 110 is a filter that has convolution operator) is applied (the results of which is shown in fig. 6C) to process all (fig. 6A: pixels B-E) pixels near a boundary (fig. 6A: BLOCK BOUNDARY) of the domain (said IDCT domain) but is not applied to process any pixels (fig. 6A: pixels A and F) in an interior of the domain (of said IDCT domain) that are not near the boundary (since A and F are farther than pixels B-E and are unprocessed as shown in fig. 6C relative to fig. 6A).

Regarding claim 3, Lee discloses 1 method of encoding all or a portion of a multi-dimensional signal with an arbitrarily shaped domain or all or a portion of a multi-dimensional signal via a multi-scale transform comprising the steps of:

- a. Obtaining the multi-dimensional signal (as shown in fig. 5);
- b. Performing the domain adaptive transform (fig. 1, numerals 10 and 20 include adaptive and transform characteristics) on the signal (fig. 5), wherein the domain adaptive transform comprises a transform (fig. 1: IDCT) in which a filter (fig. 1, num. 110) comprising convolution operator (since fig. 1, num. 110 is a filter convolution is a feature of a filter) is applied to process (the result of which is shown in fig. 6C) all pixels (fig. 6A: pixels B,C,D and E) near a boundary (fig. 6A: BLOCK BOUNDARY) of the domain (or any side of the block boundary) but is not applied (as shown in fig. 6C at pixels A and F relative to pixels A and F in fig. 6A) to process any pixels (said pixels A and F) in an interior of the domain (or any side of the block boundary) that are not near the boundary (since pixels A and F are farther from the boundary with respect to pixels B,C,D and E);
- c. Quantizing resultant decomposition coefficients; and
- d. Encoding and transmitting quantized values over an information channel to a decoder for reconstruction of an approximated signal (via MPEG a part of which is shown in fig. 1 that is known to include limitations c. and d.).

Claim 4 is rejected the same as claim 3. Thus, argument similar to that presented above for claim 3 is equally applicable to claim 4.

Claim 6 is rejected the same as claim 7. Thus, argument similar to that presented below for claim 7 is equally applicable to claim 6.

Regarding claim 7, Lee discloses the method of claim 3 where step b comprises of:

a) a combined domain and pattern adaptive transform (as shown by fig. 1, num. 20 that includes a domain that is combined with adaptive characteristics in fig. 1, num. 10).

Claim 8 is rejected the same as claim 7. Thus, argument similar to that presented above for claim 7 is equally applicable to claim 8.

Claim 9 is rejected the same as claim 3, limitations c. and d.. Thus, argument similar to that presented above for claim 3c. and 3d. is equally applicable to claim 9.

Regarding claim 15, Lee discloses the method as in any one of claims 2 or 6 where the multi-dimensional image frame (fig. 5) is a still image frame (since fig. 5 represents a frame that has no remaining motion processing).

Claim 16 is rejected the same as claim 15. Thus, argument similar to that presented above for claim 15 is equally applicable to claim 16.

Regarding claim 17, Lee discloses the method as in any one of claims 2 or 6 where the multi-dimensional image frame is a residue frame ("residual signal" in col. 3, line 39) for a sequence of video images.

Regarding claim 25, Lee discloses the method as in claim 6 where the domain adaptive transform (said IDCT) is applied such that (after said IDCT) the points external to the arbitrary domain (said pixels A and F) but within support of a filter (or filters) are excluded (as shown in fig. 6A relative to fig. 6C) from a mathematical result (as shown in fig. 6C) of a convolution(via the application of the filter to pixels) or weighted average / difference.

Regarding claim 26, Lee discloses the method as in any one of claims 1 or 6 where the domain adaptive transform is applied such that points external (fig. 8B: "Non-edge pixel") to the arbitrarily shaped domain (fig. 8B: "Edge pixel") but within support of the filter (fig. 8A) are included in a mathematical result of a convolution or weighted average / difference but are further multiplied (or re-weighted) by another set of weighting factors (as indicated in TABLE 1 in col. 11 to col. 12 that describes various weight combinations in the context of edges and the kernel).

Regarding claim 27, Lee discloses the method of claim 26 where the set of additional multiplicative factors (said TABLE 1) is determined as a result of calculation of a local measure (via said edge detection) characterizing a transition (as shown in fig. 8B, top most left Edge pixel and adjacent left Non-edge pixel) at a boundary of the arbitrary domain (Edge pixel).

Regarding claim 28, Lee discloses the method of claim 27 where the measure (said edge detection) is based on a statistical function ("Average" in col. 10, line 35) of a plurality of pixel value differences ("value[m]-Average" in col. 10, line 35) across the boundary transition (where said "value[m]-Average" corresponds to corners as shown in fig. 7C of an 8x8 block as shown in fig. 7B and shown again, unlabeled in fig. 8B where said top left most Non-edge pixel is part of said transition).

Claims 29 and 30 are rejected the same as claim 28. Thus, argument similar to that presented above for claim 28 is equally applicable to claims 29 and 30.

Regarding claim 31, Lee discloses the method of claim 28 where the statistical function is based on a weighted average (represented by the SAF column in TABLE 1 of columns 11 and 12).

Regarding claim 33, Lee discloses the method of claim 28 where the statistical function is a pre-determined constant (since the Average is divided by a constant as shown in col. 10, line 31).

Claim 34 is rejected the same as claim 27. Thus, argument similar to that presented above for claim 27 is equally applicable to claim 34.

Regarding claim 36, Lee discloses the method of claim 34 where the calculation of the local measure is based on a motion compensated model frame (fig. 1: MOTION COMPENSATOR) (or equivalent) that has already been decoded and thus made known to the decoder by the time of the inverse transform step in the context of an encoder-decoder system related to the efficient transmission or storage of a sequence of video data (the unaddressed limitations above are well known to one of ordinary skill in the art of encoding/decoding frames).

Claim Rejections - 35 USC § 103

8. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

9. Claim 10 is rejected under 35 U.S.C. 103(a) as being unpatentable over Lee et al. (US Patent 6,539,060 B1) in view of Lei et al. (US Patent 6,356,665 B1).

Regarding claim 10, Lee does not disclose claim 10 and instead uses quantization with encoding.

Lei teaches quantization with encoding that is traditional in col. 3 lines 65,66 and offers an alternative called "Bit-Plane Approach" as discussed in col. 3, line 65 to col. 4, line 22.

It would have been obvious at the time the invention was made to one of ordinary skill in the art to modify Lee's quantization with encoding that has been identified by Lei as traditional with Lei's bit-plane approach, because Lei's approach provides an "advantage" in col. 4, lines 18,19.

10. Claims 18,21 and 35 are rejected under 35 U.S.C. 103(a) as being unpatentable over Lee et al. (US Patent 6,539,060 B1) in view of Ostermann (US Patent 5,646,689).

Regarding claim 18, Lee suggests that a forward transform exists to complement Lee's fig. 1 of IDCT that is applied as the claimed domain adaptive transform

Ostermann teaches a DCT which is a forward transform and claim 18 of a calculation of coarser scale representations (via fig. 2, num. 24 that uses coarse quantization as discussed in col. 6, lines 18-22 upon the output of the claimed forward transform) in a forward transform of a multi-scale transform (since fig. 2, num. 22 is a transform used to change the resolution which is scaling, fig. 2, num. 22 is the claimed multi-scale transform).

It would have been obvious at the time the invention was made to one of ordinary skill in the art to modify Lee's implied forward transform with Ostermann's forward transform that includes quantization, because Ostermann's quantization is used for efficient bandwidth control via fine and coarse quantization during transmission to a decoder as discussed in col. 1, lines 26-29.

Regarding claim 21, Lee teaches the method as in any one of claim 18 where instead of the domain adaptive transform, a pattern adaptive transform is used (since Lee uses an adaptive transform with edge detection, Lee's transform is a pattern adaptive transform).

Regarding claim 35, Lee implies that an encoder is used with Lee's decoder/dequantization.

Ostermann teaches an encoder as shown in fig. 2 and claim 35 of one or more coarser scales of representation of the signal (via coarse quantization as discussed in col. 6, lines 10-23) which have already been decoded (via an implied decoder) and thus made known to the decoder by the time of the inverse transform step.

It would have been obvious at the time the invention was made to one of ordinary skill in the art to modify Lee's teaching of an encoder and dequantization with Ostermann's encoder for the same reasons as claim 18, above.

11. Claims 19,20 and 22-24 are rejected under 35 U.S.C. 103(a) as being unpatentable over Lee et al. (US Patent 6,539,060 B1) in view of Etoh (US Patent 5,859,932).

Regarding claim 19, Lee applies the claimed transform or said IDCT with post-filtering.

Etoh applies an IDCT in fig. 2, num. 217 and teaches converting from DCT/IDCT to the claimed sub-band decomposition/composition of a multi-scale transform as indicated in fig. 3, numerals 307 and 321 and claim 19 of where the domain adaptive transform is applied (during conversion from IDCT to composition) during the estimation of next finer scale representations (of the composition that corresponds to "more visually important components" in col. 12, lines 8-12) in an inverse transform (said composition) of a multi-scale transform during the reconstruction phase (or decoding) either in conjunction with or irrespective of the use of the method in claim 18.

It would have been obvious at the time the invention was made to one of ordinary skill in the art to modify Lee's IDCT and post-filtering with Etoh's composition/decomposition, because Etoh's composition does not include blocking artifacts as DCT/IDCT does as discussed in col. 4, lines 25-41 as saves from post-filtering as done in Lee.

Regarding claim 20, Lee does not teach claim 20 and applies the domain adaptive transform or said IDCT.

Etoh applies an IDCT in fig. 2, num. 217 and teaches converting from DCT/IDCT to the claimed sub-band decomposition/composition of a multi-scale transform as indicated in fig. 3, numerals 307 and 321.

It would have been obvious at the time the invention was made to one of ordinary skill in the art to modify Lee's IDCT with Etoh's composition/decomposition, because Etoh's composition does not include blocking artifacts as DCT/IDCT does as discussed in col. 4, lines 25-41.

Regarding claim 22, Lee teaches the method of claim 20 where instead of the domain adaptive transform (said IDCT), a combined pattern and domain adaptive transform is used (since said IDCT has a frequency and spatial domain and includes edge detection and is used with an adaptive filter, IDCT is the claimed combined pattern and domain adaptive transform).

Claim 23 is rejected the same as claim 19. Thus, argument similar to that presented above for claim 19 is equally applicable to claim 23.

Regarding claim 24, Etoh teaches the methods of claim 19 where the domain adaptive transform is applied (during said conversion) with the presence of quantization (fig. 1, num. 104).

12. Claim 32 and 37-42 are rejected under 35 U.S.C. 103(a) as being unpatentable over Lee et al. (US Patent 6,539,060 B1) in view of Avinash (US Patent 6,757,442).

Claim 32 is rejected the same as claim 41. Thus, argument similar to that presented below for claim 41 is equally applicable to claim 32.

Regarding claim 37, Lee does not disclose claim 37 and instead teaches post-filtering as shown in fig. 1, num. 10 that includes averages corresponding to TABLE 1 in columns 11 and 12.

Avinash teaches filtering as shown in fig. 3, num. 55 that includes renormalization in fig. 4, num. 74 and claim 37:

where a function (fig. 4, numerals 62-72) for renormalization (fig. 4, num. 74), i.e. replacement of the missing filter coefficients (not that the claimed "i.e." is interpreted as an "or" limitation so that the claimed "replacement of the missing filter coefficients" are excluded), is accomplished by a statistical function (at least one of said fig. 4, numerals 68-72 includes a statistical function) of remaining pixel values (separated from a thresholding operation of fig. 7 and of fig. 5, numerals 84 and 86 that separates pixels corresponding to fig. 2, num. 36) which are located at points contained within the arbitrary shaped domain (as shown in fig. 2 as num. 48 or 52).

It would have been obvious at the time the invention was made to one of ordinary skill in the art to modify Lee's post filtering with Avinash's filter, because Avinash's filter has a plurality of benefits such as enhancing structural features, sharpening structural features and removing or smoothing noise as discussed in col. 2, lines 56-67.

Regarding claim 38, Avinash discloses the method of claim 37 where the statistical function is based on the median (fig. 11:202: "WEIGHTED AVERAGE" corresponds to the claimed median).

Claims 39 and 40 are rejected the same as claim 38. Thus, argument similar to that presented above for claim 38 is equally applicable to claims 39 and 40.

Regarding claim 41, Avinash discloses the method of claim 40 where the statistical function is a weighted average (see claim 38, above) with coefficients (via an equation $p(x,y)$ in col. 18, line 35) that are nonlinear (as said equation has superscripts) functions of the data values themselves.

Regarding claim 42, Avinash discloses the method of claim 37 where some form of outlier rejection (or noise removal) is used (in fig. 4) to ensure that outliers (or noise) remaining inside the intersection of the domain and the filter support do not disrupt the local accuracy or efficiency (or blending with minimal noise) of the transform (fig. 4, num. 76).

Conclusion

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not

mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Dennis Rosario whose telephone number is (571) 272-7397. The examiner can normally be reached on 9-5.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Matthew Bella can be reached on (571) 272-7778. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Dennis Rosario/
Examiner, Art Unit 2624

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